RCP Can-F3
Version 7.5

Technical Description
User Manual

Rev. B

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Description

The **RCP Can-F3** is electronic module designed for remote control of fuel-fired heater (parking heater, fuel operated heater, pre-heater), factory installed on **Ford Kuga 2** (2012-), **Focus 3** (2011-), **Ford C-Max 2** (2011-) and **Ford Grand C-Max** (2011-). The device controls the heater via CAN-bus.

Module's Possibilities

- Embedded heater's remote control using the car's remote control key
- Set of inputs for outer heater's remote control using various impulses
- Set of outputs with programmable heater's status signals
- Remote cancellation of heater startup, programmed in the driver information system
- Indication of heater's autonomous operation with the direction indicators flashing in the rearview mirrors
- Extended boost heat mode control for diesel engines
- Additional protection of the main battery from discharging inspecting voltage level and time of autonomous operation of the heater

Package Content

1. RCP Can-F3 module
2. Plug-n-play cable
3. Wiring for permanent connection
4. Installation set
5. Technical Description brochure
6. Installation Manual brochure

Basic Functions

1. To start/stop the heater with additionally installed remote control device, see documentation for the remote control device. The functions of the remote control depend on its possibilities, connection schemes and module's settings.
2. To start the heater with Ford key, press "Lock" button 3 times on the key. Time intervals between presses must not exceed 20 seconds. The unlocking of the vehicle or time interval excess restarts the counter of "Lock" button presses. Watch the direction indicators to be sure that RCP has received a command from the key. Every button pressing is confirmed with hazard signals flashing. Also it is possible to adjust the module to confirm with direction indicators flashing in the rearview mirrors that starting combination is received (6.1 setup item) and that the heater started (6.2 setup item).
   If combination of Lock button presses has no effect (no heater startup, no error appearance,) try another combination: 3 Unlock button presses, then Lock button press.
3. By default RCP adjusted only to switch on the heater using remote control key. To switch off the heater using the key, change the setup item 3.1. As both the commands use the same combination of "Lock" presses, you should know a condition of the heater before you send a command. Therefore it is recommended to activate setup items 6.4 – 6.6 to see the heater's status by the means of direction indicators' flashing in the rearview mirrors. The possibility to stop the heater remotely may be useful in the case of cancelation of a trip, including one programmed in the DIS.
4. It is possible remotely disable startups of the heater, programmed in the DIS. Use additional remote control to send stop command when the heater is idle (not possible with Ford key). Starting the heater any way or turning the ignition to "on" position enables DIS programs again.
5. Additionally installed button has several functions. Current function depends on the heater condition, the ignition condition and the engine condition (see table. 3)

When the ignition is turned off, button is used for immediate start or stop of the heater. Button pressing changes heater's condition to another one: switches off the operated heater and switches on the idle heater.

When the ignition is turned on, button pressing keeps the current condition of the heater after the engine's startup. So, if the heater has operated before the engine start, it may continue operate after the engine starts (in boost heat mode). If the heater has been idle before engine starting, button pressing informs RCP doesn't let the heater to start in the boost heat mode when the engine is running. These functions are called quick enabling and disabling of

the boost heat mode respectively. Being activated they act for the one ignition's cycle. Turning the ignition off cancels the function activity.

When the engine runs, the button pressing enables or disables the boost heat mode.

Warning! The parking heater must not be operated at filling stations, near sources of combustible vapours or dust or in enclosed spaces

Table 3

Button function	Ignition status	Engine status	Heater status	Description (how to use)
Heater immediate start	Off	Not running	Off	One-touch heater start
Heater immediate stop	Off	Not running	On	One-touch heater stop
One-time boost disable*	On	Not running	Off	Quick disabling of boost heat mode for short trips
One-time boost enable*	On	Not running	On	Quick enabling of boost heat mode in the case of boost heat mode disabling by RCP settings or in the case of one-time disabling previously
	On	Running	Off	

* function for cars with diesel engines only

The fuel fired heater needs about 3 minutes to go to the normal operation after the startup. If your trip is planned to be shorter, it is highly recommended to use a button function called "one-time boost disable". This preserves the heater from premature clogging. Turn on the ignition, press the button, then start the engine. Now the heater will not operate with the engine while don't you turn the ignition off or use "one-time boost enable" function.

6. If you control boost heat mode by the means of RCP module, it is necessary to enable auxiliary heating in DIS: Settings > Convenience > Aux heater > On

Pay attention: Independently of the module's settings only one cycle of auxiliary heating in boost heat mode is possible. Restarting of auxiliary heating is comes in two ways: restart the engine or switch "Off" and then "On" again the "Aux heater" menu item in DIS.

An additional LED, connected to the module, will light when auxiliary heating is active.

Additional Functions

By default RCP is adjusted to perform only the basic functions, such as start and stop the heater using the remote control key. To turn on the additional functions such as battery monitoring, flashing with direction indicators in the rearview mirrors, etc. enter the module into Setup mode and activate the corresponding setup item (see settings table 2).

A programming button and the brakes pedal are used to enter setup mode and to the settings change. You can use either additionally installed button, or front passenger's window close button on the driver's door control panel as programming button. Some car versions not allow using power window control button as programming button. Use additional button in that case.

It is necessary to stop the engine and the heater before. Turn the ignition on, press and hold the brakes pedal. Then 3 times press the programming button (press and hold additional button until LED goes off, about 1.5 seconds). Both direction indicators in the CIP confirm entering to the setup mode with 2 flashes. Release the brakes pedal finally.

Each setup item in the settings table is a 3-digit code. To enter a digit of a code, shortly press the button so much times, as corresponds to a digit. The LED and the direction indicators symbols in the CIP confirm each button press: the LED briefly goes off, the left direction indicator flashes one time when the first or the third digit of code is entered, the right direction indicator - when the second digit of code is entered. To complete a digit entering, press and release brakes pedal. The CIP confirms it with one flash of both direction indicators simultaneously. When all three digits entered, the module checks the code for validity and confirms it with the direction indicators flashing. The both direction indicators flash twice simultaneously in the case of valid code and flash twice alternately in the case of invalid code.

If entered digit is not correct, press and release brakes button until the module indicates an error. Enter the code once more in that case. Several codes can be entered without exit of setup mode.

Turn the ignition off to exit setup mode. New settings are saved in the nonvolatile memory of the module and stored there regardless of whether the module is connected or not. **Attention:** If you start the engine without exit Setup mode, new settings will not be saved in memory.

To reset the module to the factory settings, enter the code 8.1.1. Both direction indicators in the CIP should flash three times, confirming command execution. Then the module exits Setup mode and restarts.

To clear all the errors in the heater's memory and thus unblock the heater, enter the code 9.1.1. Both direction indicators flash five times confirming errors clearing. If unblocking of the heater is impossible, the indicators flash five times alternatively. **Pay attention**: when you apply unblocking function for the first time, RCP remembers VIN code of the car. In the future unblock function will work only for this car.

Settings Table (4)

1. Boost Heat Mode (Auxiliary Heating) Control[1]	**1.2.** Additional engine heating disable by coolant temperature (in Celsius degrees)[3]	**1.2.1** *Not applied **1.2.2** Higher than 0 degrees **1.2.3** Higher than +10 degrees **1.2.4** Higher than +20 degrees **1.2.5** Higher than +30 degrees **1.2.6** Higher than +40 degrees ***1.2.7*** *Higher than +50 degrees* **1.2.8** Higher than +60 degrees **1.2.9** Higher than +65 degrees **1.2.10** Higher than +70 degrees
2. Heater Timing	**2.1.** Limitation of heater's total operation time in pre-heat mode	**2.1.1** *One cycle (as the heater's manufacturer defined, 1-30 minutes)[6] **2.1.2** 40 minutes **2.1.3** 50 minutes **2.1.4** 60 minutes **2.1.5** *70 minutes* **2.1.6** 80 minutes **2.1.7** 90 minutes **2.1.8** 100 minutes **2.1.9** 120 minutes
	2.2. Limitation of heater's cycle operation time in pre-heat mode	**2.2.1** 10 minutes **2.2.2** 15 minutes **2.2.3** 20 minutes **2.2.4** 25 minutes **2.2.5** **30 minutes*
3. Heater remote control with remote control key	**3.1.** "Lock" button's function for the heater control	**3.1.1** *Heater start only **3.1.2** Start of idle heater, stop of operated heater
	3.2. Number of sequential "Lock" button presses for the heater control	**3.2.1** Combination is disabled **3.2.2** Two presses **3.2.3** **Three presses* **3.2.4** Four presses **3.2.5** Five presses **3.2.6** Six presses
4. Battery Monitoring	**4.1.** Minimal battery voltage that lets the module start the heater in pre-heat mode	**4.1.1** * Not adjusted **4.1.2** 11.4V **4.1.3** 11.6V **4.1.4** 11.8V **4.1.5** *12.0V* **4.1.6** 12.1V

		4.1.7 12.2V **4.1.8** 12.3V **4.1.9** 12.4V
	4.2. Minimal battery voltage that lets the module keep operating the heater in pre-heat mode [2]	**4.2.1** * Not adjusted **4.2.2** 10.6V **4.2.3** 10.8V **4.2.4** 11.0V **4.2.5** 11.2V **4.2.6** *11.4V* **4.2.7** 11.5V **4.2.8** 11.6V **4.2.9** 11.7 V
6. Indication of the heater's status using the car's lighting and the direction indicators in the rearview mirrors	**6.1.** Indication of command reception from a remote control[7]	**6.1.1** *Off **6.1.2** Three flashes
	6.2. Indication of successful startup of the heater from a remote control	**6.2.1** *Off **6.2.2** Seven flashes
	6.3. Indication of the heater's operation, when starting source is the remote control	**6.3.1** *Off **6.3.2** On
	6.4. Indication of the heater's operation, when starting source is the CIP (direct or timer start)	**6.4.1** *Off **6.4.2** On
	6.5. Indication of the heater's operation, when starting source is additional button	**6.5.1** *Off **6.5.2** On
	6.7. Flashing frequency for 6.3-6.5 Setup items	**6.7.1** One flash within 3 sec **6.7.2** One flash within 5 sec **6.7.3** ** One flash within 10 sec* **6.7.4** One flash within 15 sec

7. Output signals adjustment	**7.3.** Notification signal feed to the output “Alert_1”	**7.3.1** *"Heater started"[4] **7.3.2** "Heater stopped"[4] **7.3.5** "Heater started to burn"[4] **7.3.6** “Heating finished **7.3.7** "Error occured" **7.3.8** Disable the output
	7.4. Notification signal feed to the output “Alert_2”	**7.4.1** "Heater started"[4] **7.4.2** *"Heater stopped"[4] **7.4.5** "Heater started to burn"[4] **7.4.6** “Heating finished **7.4.7** "Error occured" **7.4.8** Disable the output
	7.5. Signal feed to the output “Status_Minus”	**7.5.1** Heater operates (potential) **7.5.2** *Heater operates autonomously (from battery, engine is off) (potential) **7.5.3** Hazard flashers control (double impulses with the frequency adjusted by 6.7, applying settings 6.3-6.5)[5] **7.5.4** Engine runs (potential) **7.5.5** Engine runs (RPM impulses) **7.5.6.** Ventilation is on during the heater operation (potential) **7.5.7.** Ventilation is off during the heater operation (potential) **7.5.8.** Heater operates autonomously, coolant temperature lower than 30˚C (potential) **7.5.9.** Heater operates autonomously, coolant temperature higher than 30˚C (potential) **7.5.10.** Disable the output
	7.6. Signal feed to the output “Status_Plus”	**7.6.1** Heater operates (potential) **7.6.2** Heater operates autonomously (from battery, engine is off) (potential) **7.6.3** *Feedback for Defa Vehicle Unit **7.6.4** Engine runs (potential) **7.6.5** Ventilation is on during the heater autonomous operation (potential) **7.6.6.** Disable the output
8. Settings reset		**8.1.1** Apply default settings
9. Heater errors reset		**9.1.1** Clear all errors in heater’s memory, resulting heater unblocking

* Factory setting
Recommended settings marked in italics

[1] – It is necessary to enable auxiliary heating in DIS for extended boost heat mode possibilities (settings 1.2, for the cars with diesel engines only): Settings > Convenience > Aux heater > On
[2] –RCP turns off the heater if the battery voltage becomes lower than preset
[3] – Setting is not tested yet
[4] – Signals appear only at the heater autonomous operation
[5] – Signal is used for indication by all the hazard flashers. It uses 1-wire connection to the hazard alarm button (see installation manual for details). Indication by the turn signals via CAN-bus is switched off
[6] – By default the heater can be restarted only after the engine start, as heater's manufacturer has desired. The settings 2.1.2-2.1.5 give a possibility to restart the heater at any time. The audio unit can turn on at restart of the heater and automatically turns off in 15 minutes.
[7] – Only for the car's remote control key

Signals

The module has two connectors: 9-pin connector X1 (table 1) for input signals and power connection, 10-pin connector X2 (table 2) for output signals, special signals and CAN-bus connection. The first pin on each connector is marked by the key.

Table 1

X1 pin number	**Signal name**	**Polarity**	**Wire colour**
1	Heater_off+	+	White
2	Heater_off-	-	Grey
3	Heater_on+	+	Green
4	Heater_on-	-	Blue
5	Button	-	Brown
6	Timer_in	+	Orange
7	RC_in	+	Yellow
8	*Ground*		*Black*
9	*Battery Power*		*Red*

The signals to be necessarily connected are marked in the table in Italics

Table 2

X2 pin number	Signal name	Polarity	Wire colour	Maximum electric load*, mA
1	Status_Plus	+	Blue-white	500
2	Status_Minus	-	Yellow	500
3	Alert_1	-	Grey	500
4	Alert_2	-	Orange	500
5	Engine_RS	-	Blue	500
6	Indication	+	Red-white	1000
7	Sensor_In	-	Green-yellow	
8	Sensor_Out	-	Green	500
9	*CAN-L*		*Brown-white*	
10	*CAN-H*		*Brown*	

*The connection of outputs 2-5 directly to the Power, without a load, is not permitted. The connection of outputs 1 and 6 directly to the Ground, without a load, is not permitted

The signals to be necessarily connected are marked in the table in Italics

X1.1 Heater_off+

The input can be used to switch off the heater, operated in pre-heat mode, by the impulse of positive polarity (the input **Heater_off-** in that case has to be connected to the Ground). The heater is stopped by the leading edge of the impulse. If the heater is idle, positive impulse on this input cancels the program start of the heater, programmed by DIS.

X1.2 Heater_off-

The input can be used to switch off the heater, operated in pre-heat mode, by the impulse of negative polarity (the input **Heater_off+** in that case has to be connected to the Power). The heater is stopped by the leading edge of the impulse. If the heater is idle, negative impulse on this input cancels the program start of the heater, programmed by DIS. This input is suitable for the most alarm systems and GSM-modules connections in order to control the heater remotely.

X1.3 Heater_on+

The input can be used to switch the heater on by the impulse of positive polarity (the input **Heater_on-** in that case has to be connected to the Ground). The heater is started by the leading edge of the impulse.

X1.4 Heater_on-

The input can be used to switch the heater on by the impulse of negative polarity (the input **Heater_on+** in that case has to be connected to the Power). The heater is started by the leading edge of the impulse. This input is suitable for the most alarm systems and GSM-modules connections in order to control the heater remotely.

X1.5 Button
The input for the connection of multifunctional button. The current function of the button depends on the heater status, ignition status and the engine status (see Table 4 for more details)

X1.6 Timer_in
Not used

X1.7 RC_in
The input can be used to switch the heater on/off by the impulse of positive polarity. The heater is turned on by the leading edge of an impulse and is turned off by the trailing edge of the impulse. Specialized remotes such as Smart Start, Easy Start and Telestart can be connected to the input. GSM-modules with outputs driven by potential signal also may be connected to the input.

X1.8 Ground

X1.9 Power +12V

X2.1 Status_Plus
The assignment of this output is defined by the setting 7.6. By default special signal for Defa Smart Start (settings 7.6.3) is used to inform the remote control unit that the heater has been switched off. When the heater switches off, the impulse of positive polarity with 0.5 second duration appears on the output. When the engine is running, the output is permanently pulled up to the power supply.

X2.2 Status_Minus
The assignment of this output is defined by the setting 7.5. By default the signal "Heater operates autonomously" is given on the output.

X2.3 Alert_1
The signal is used to receive a notification to remote control (if remote is compatible to alerts receiving). The assignment of this output is defined by the setting 7.3. When programmed event is occurred, the impulse of negative polarity with 1 second duration appears on the output. By default the signal "Heater started" is given on the output.

X2.4 Alert_2
The signal is used to receive a notification to remote control (if remote is compatible to alerts receiving). The assignment of this output is defined by the

setting 7.4. When programmed event is occurred, the impulse of negative polarity with 1 second duration appears on the output. By default the signal “Heater stopped” is given on the output.

X2.5 Engine_RS
Not used

X2.6 Indication
The output can be used for connection of stand alone or built-in to a button indicator, which will inform user about heater run-time errors.

X2.7 Sensor_In
Not used

X2.8 Sensor_Out
Not used

X2.9 CAN-L
Low-level CAN bus line has to be connected to the violet-orange wire of Medium Speed CAN bus.

X2.10 CAN-H
High-level CAN bus line has to be connected to the grey-orange wire of Medium Speed CAN bus.

Connection

RCP Can is recommended for professional installation. It needs at least some experience in car electronics installation.
See installation manual for detailed connection schemes.

Troubleshooting

If a run-time error occurs at the start of the heater, RCP Can will inform you by the built-in and additional LEDs blinking about the error code. The number of flashes corresponds to the error code. See table 5 for the codes description and possible solutions.

Table 5

Error Code	Error Description	Possible Reasons of Error Appearance	Solutions
2	No answer from the heater followed the start command	Outer temperature is upper than +15 Celsius degrees	The heater works only with outside temperatures below +15°C. It is the heater manufacturer's restriction
		Fuel level in the tank is close to empty (“Fuel Low” warning indicator is lighting in DIS)	Refuel the car
		The heater is blocked after 5 unsuccessful starts	Try to start the heater from DIS menu. If it not started to burn, check for fuel and coolant quality (especially at extreme cold temperatures) and possible heater’s exhaust system clogging by snow. Then unblock the heater in the Setup mode.
3	Battery low	The module has determined that the battery voltage at the heater startup or during the heater operation is below the specified settings 4.1 и 4.2	Charge vehicle’s battery with special charger (or start engine to charge) or cancel 4.1/4.2 module’s settings
4	Time limits exceeded	The heater’s restart is not possible without engine run. It is the heater’s manufacturer restriction	Change default setting 2.1.1 to another one (2.1.2 - 2.1.9) to enable heater restart and bypass the restriction. Run the engine otherwise.
5	Unsuccess-ful start	Time limit for autonomous operation of the heater has achieved (with active setting 2.1.2 - 2.1.9)	Run the engine. It is recommended to have trips between heater operation cycles longer than heater operation cycles

		The heater switched off spontaneously at startup	Make diagnostics of the heater if the error appears again
6	Operation cycle too short	The heater was switched off spontaneously with operating time of less than 20 minutes	Make diagnostics of the heater if the error appears again
8	CAN-bus error	There is a problem with connection of the module to the CAN-bus	Check the module's connection
9	Settings error	Settings have been incorrectly stored in RCP memory	Reset the settings (8.1.1), readjust RCP
11	Heater no connection	The heater is unplugged from CAN-bus or is out of order	Make diagnostics of the heater

Glossary

CAN - Control Area Network (digital network for data transfer in vehicles)
RCP - Remote Control Plug-in (electronic module for the heater remote control)
DIS - Driver Information System (information displays) of the instrument cluster
BHM or Boost Heat Mode – operational mode of the heater, when it operates together with the engine to help the engine and the interior warm up more quickly. BHM is available for the cars with diesel engines only